

# Predictive Value of the Miami Emergency Neurologic Deficit (MEND) Exam for Detecting Large Vessel Occlusion Strokes



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## Background

- Recent developments in the care of ischemic stroke patients with large vessel occlusion (LVO) have highlighted the need to transport these patients to comprehensive stroke centers (CSC) with neurointerventional capabilities.
- This field triage requires a screening tool that can rapidly and accurately identify LVO patients.
- Several scales have been developed to accurately and reliably predict LVO, however, a recent study revealed that several clinical scores did not reliably predict large artery occlusion (defined as proximal internal carotid artery (ICA), middle cerebral artery (MCA), and basilar artery).<sup>1</sup>
- The Miami Emergency Neurologic Deficit (MEND) exam is a brief, practical, and effective screening tool for identifying stroke patients in the field.<sup>2</sup>
- It was developed in 1998 by a group of stroke neurologists, emergency physicians, neuroscience nurses and paramedics.
- The MEND exam contains the Cincinnati Prehospital Stroke Scale (CPSS), and additional components from the National Institutes of Health Stroke Scale (NIHSS) to detect both anterior and posterior circulation strokes.
- A previous study showed that the MEND exam performed by paramedics in the field highly correlated with the NIHSS performed by the stroke team on arrival to the hospital.<sup>3</sup>

## Purpose

- The purpose of this study was to determine the predictive value of the MEND exam for detecting LVO stroke, when completed by prehospital providers in the field.

## Methods

- Paramedics and flight nurses in Monroe County, FL were trained in the Advanced Stroke Life Support (ASLS<sup>®</sup>) Curriculum, which incorporates hands-on MEND exam training.
- Paramedics performed the MEND exam in the field on patients suspected of having a stroke.
- The patients were then airlifted directly from the scene in Monroe County, FL to Jackson Memorial Hospital, a comprehensive stroke center in Miami, FL.
- Upon arrival, patients were evaluated by the Emergency Department (ED) physician and the Stroke Team, who performed an NIHSS.
- The investigators analyzed MEND exam findings conducted by paramedics on consecutive patients suspected of having stroke, and a convenience sample of additional emergency medical services (EMS) patients with various complaints.
- Hospital electronic health records were then reviewed to determine whether the patients had LVO, based on imaging results (CTA and MRA).
- If imaging was not available, two independent physicians, who were blinded to the MEND exam results, reviewed the medical records to determine whether the patient's neurological findings were consistent with large vessel occlusion or not.
- LVO was defined as a total occlusion of the ICA, MCA-M1, MCA-M2, ACA-A1, ACA-A2, BA, VA, PCA-P1, or PCA-P2, consistent with other studies of endovascular therapy.
- Receiver operating characteristic curves, sensitivity, specificity, positive predictive value and negative predictive value were determined.
- Statistical analysis was conducted by biostatisticians at the University of Miami Miller School of Medicine using SAS, v.9.3.

## MEND Exam

The MEND Exam form is divided into three main sections: MENTAL STATUS, CRANIAL NERVES, and LIMBS. Each section contains specific clinical questions with checkboxes for 'Normal' and 'Abnormal' results. The 'Abnormal' results are defined in the form. The form also includes checkboxes for 'RT' (Right) and 'LT' (Left) for the Cranial Nerves and Limbs sections.

Figure 1: Miami Emergency Neurologic Deficit (MEND) Exam

## Results

MEND SCORE	≥2	≥3	≥4	≥5
Sensitivity	98%	98%	81%	60%
Specificity	10%	29%	51%	65%
PPV	38%	43%	48%	49%
NPV	89%	96%	83%	74%

Table 1: Accuracy of the MEND Exam for Diagnosis of Large Vessel Occlusion for various score cut-offs

## Results

- From September 2008 to June 2017, 143 patients presenting to EMS had MEND exams completed.
- Of these, 121 were airlifted to a CSC, and had the NIHSS performed.
- The average MEND score was 5 (range 0-14) and the average NIHSS score was 10 (range 0-34).
- Of 101 strokes, 89 were ischemic (88%) and 12 hemorrhagic (12%).
- Area under the curve for MEND exam predictability for final diagnosis of stroke or TIA was 0.65 (95% CI 0.49-0.75).
- The sensitivity, specificity, PPV and NPV for different score cut-offs of the MEND exam were:
  - MEND ≥3: 0.98, 0.29, 0.43, 0.96
  - MEND ≥4: 0.81, 0.51, 0.48, 0.83
  - MEND ≥5: 0.60, 0.65, 0.49, 0.74

## Conclusions

- The MEND is a simple and rapid evaluation that can be performed in the field by EMS personnel to screen for LVO strokes.
- In our study, a MEND score ≥3 identified 98% of LVOs, and a score ≥4 identified 81% of LVOs, with improved specificity.
- A cut-off of ≥3 captured the vast majority of LVO strokes.

## References

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## Acknowledgements

We would like to thank all of the Monroe County Fire Rescue paramedics and flight nurses for their help with the study and for their tireless efforts in providing the best care possible to stroke patients.

The authors would like to acknowledge the funding support from the State of Florida Department of Education.

This study was approved by the University of Miami Institutional Review Board (#20120370).